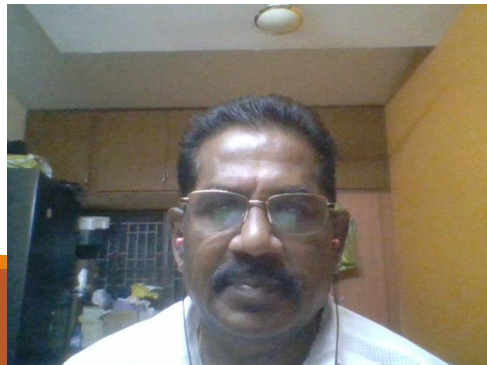
Parts of an Aircraft-1

DR. M. ELANGOVAN

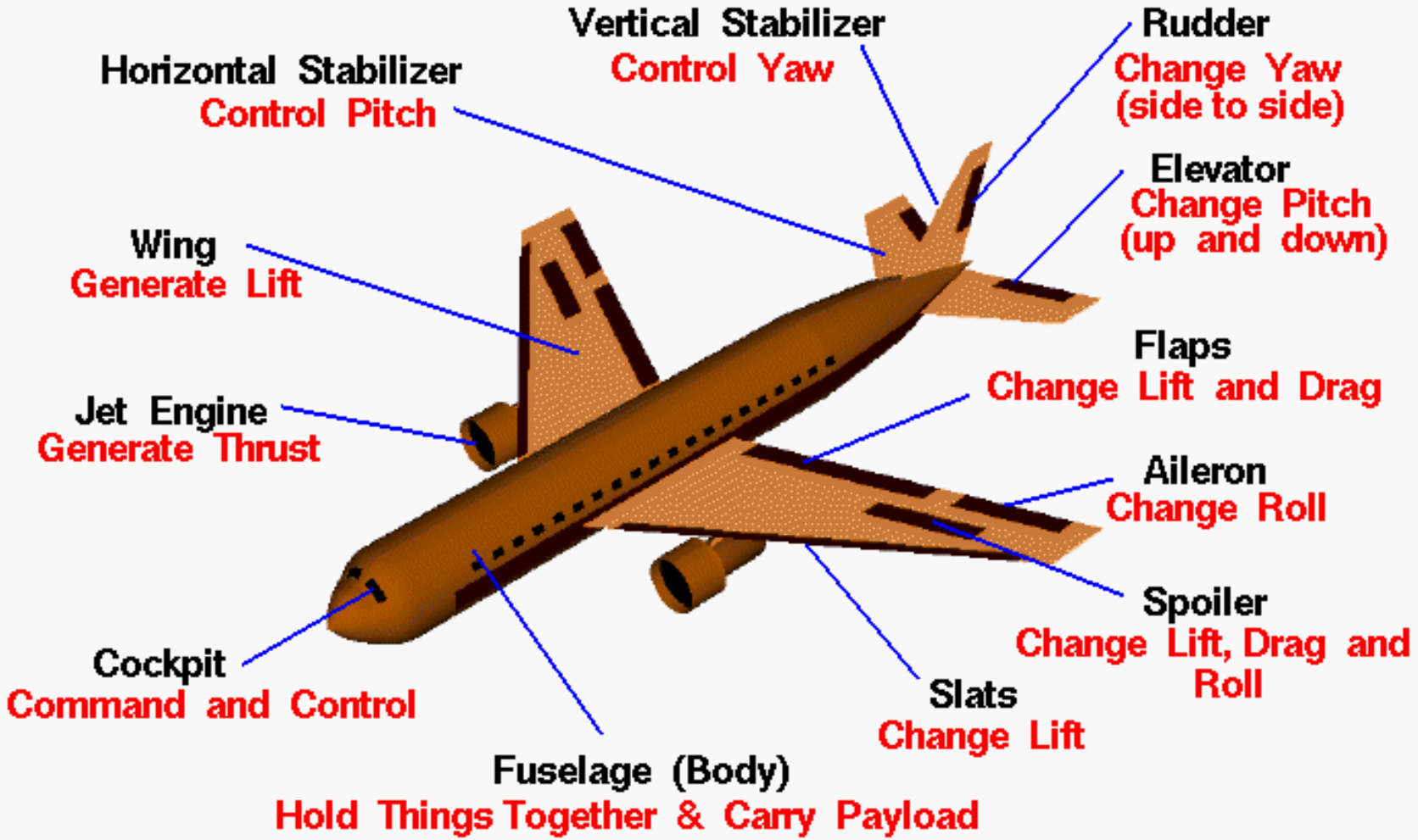
PROFESSOR, DEPARTMENT OF AEROSPACE ENGINEERING

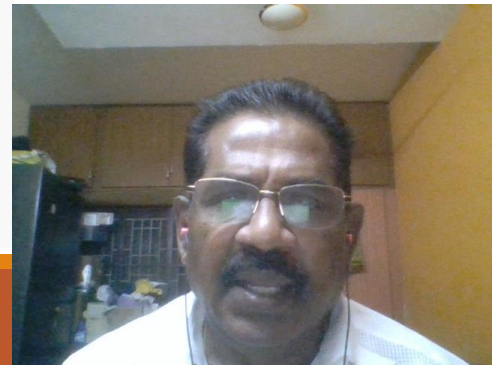
SNS COLLEGE OF TECHNOLOGY



Airplane Parts Definitions
and Function

Glenn Research Center





Wing

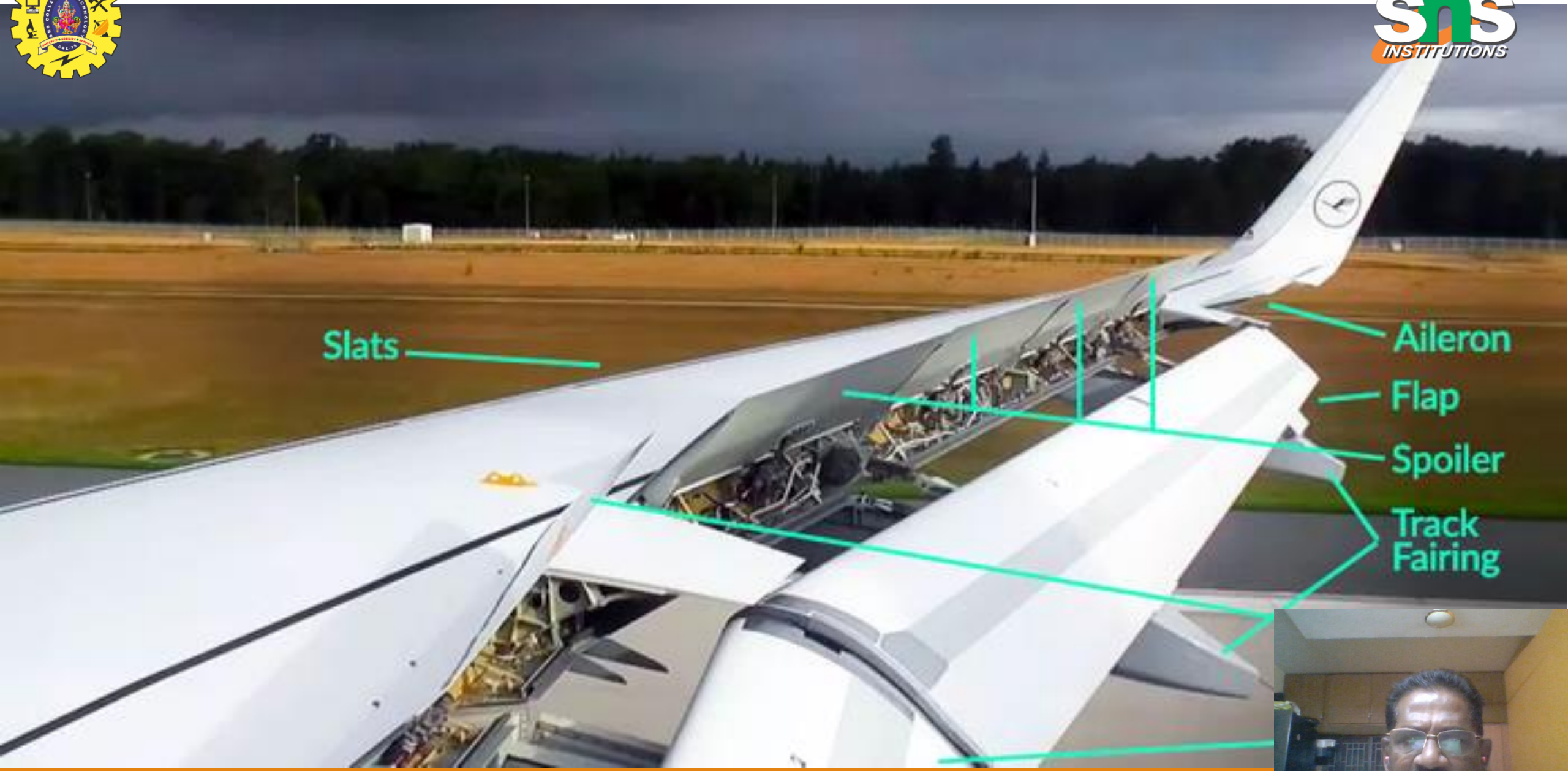
A **wing** is a type of fin that produces lift while moving through air or some other fluid.

Accordingly, wings have streamlined cross-sections that are subject to aerodynamic forces and act as airfoils.

A wing's aerodynamic efficiency is expressed as its lift-to-drag ratio.

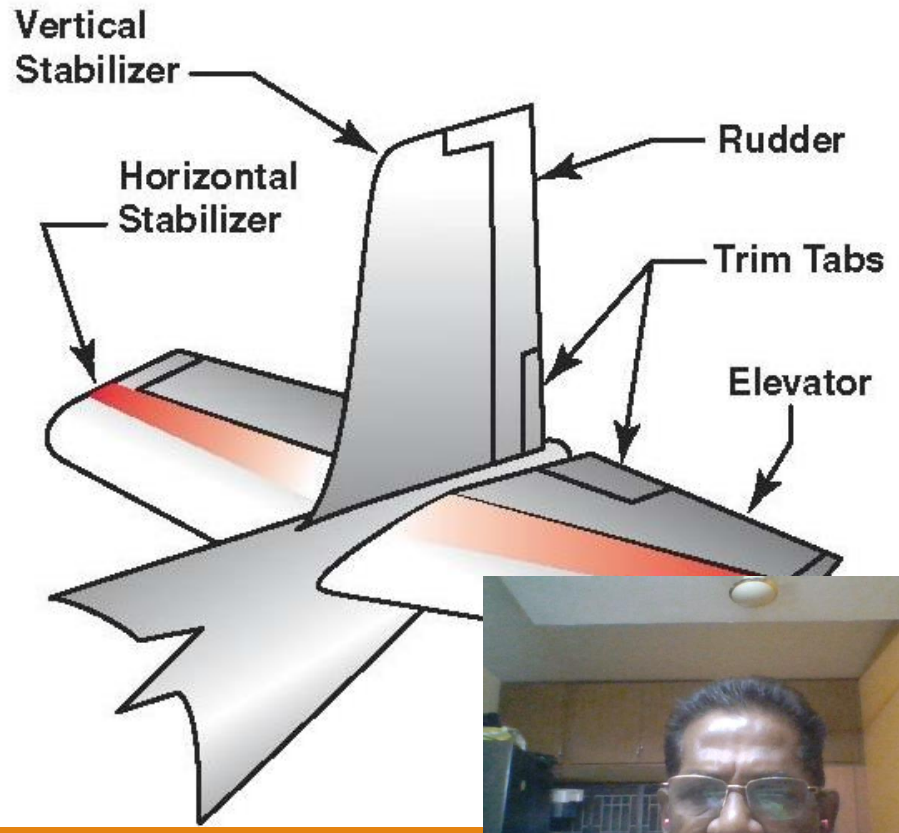
The lift a wing generates at a given speed and angle of attack can be one to two orders of magnitude greater than the total drag on the wing

A high lift-to-drag ratio requires a significantly smaller thrust to propel the wings through the air at sufficient lift.


Slats
Aileron
Flap
Spoiler
Track
Fairing

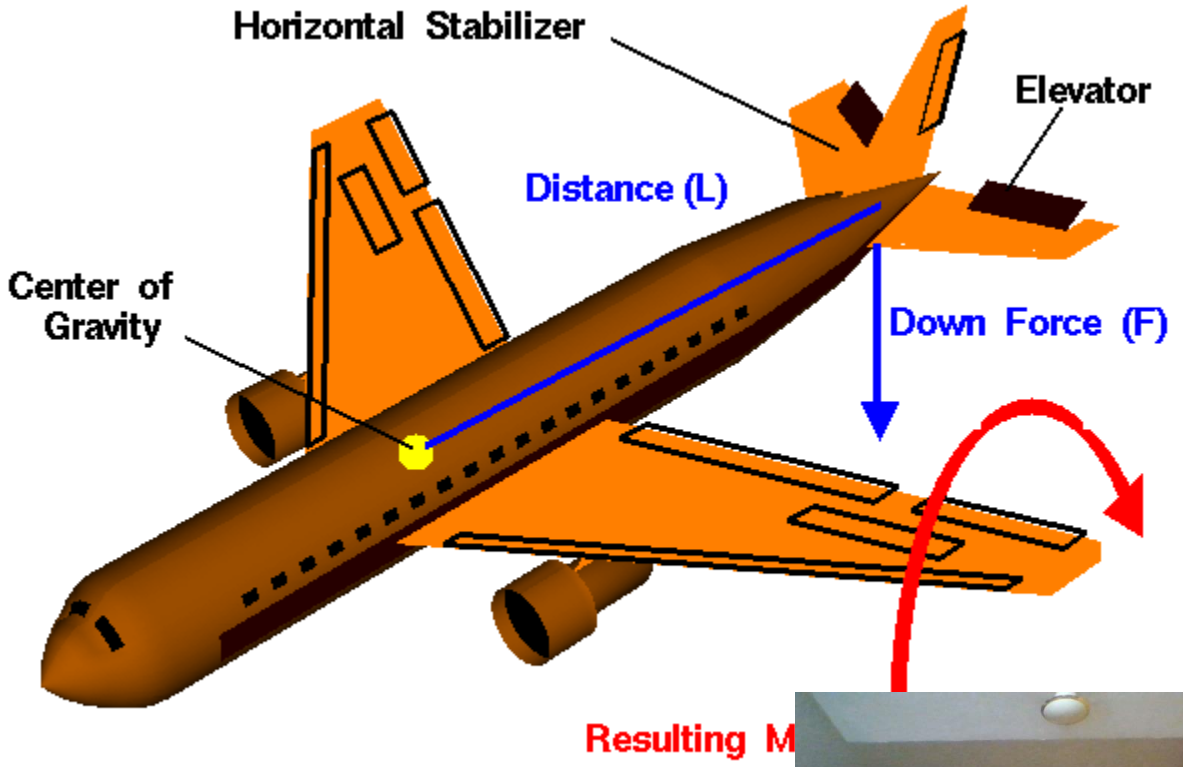
Why do airplanes need stabilizers?

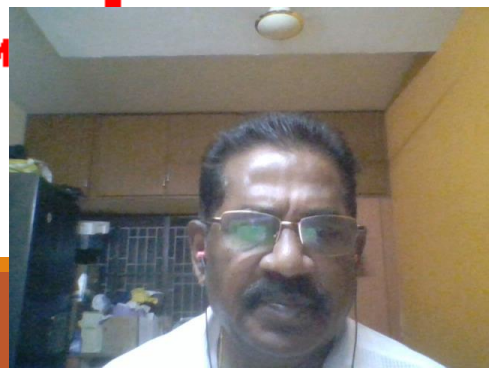
- Airplanes are exposed to fast-moving winds during flight, which can affect their maneuverability.
- Fortunately, they feature aerodynamic surfaces like stabilizers to provide control and stability.
- Stabilizers will stabilize the airplane during flight so that pilots can safely and effectively maneuver it.



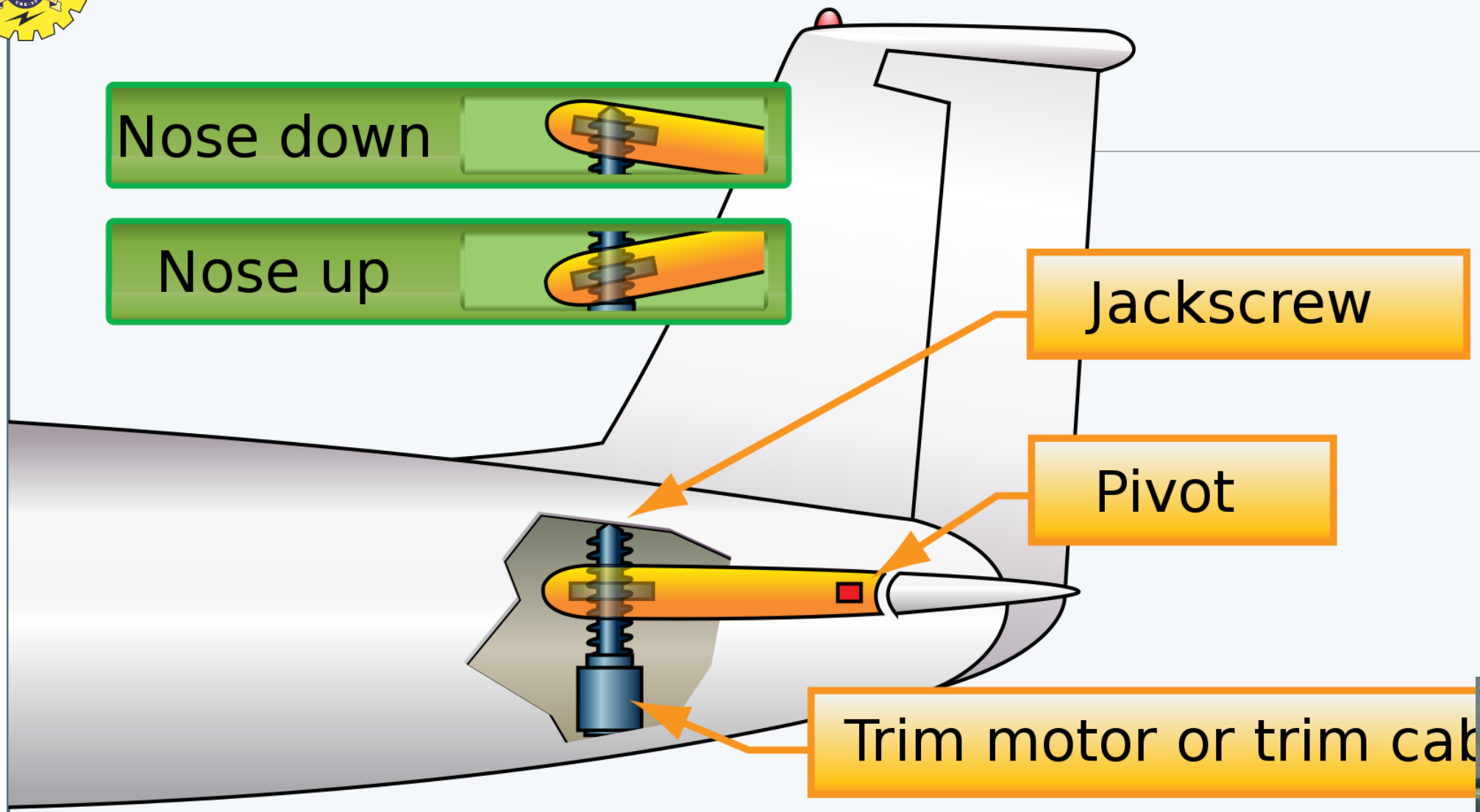
Horizontal Stabilizer

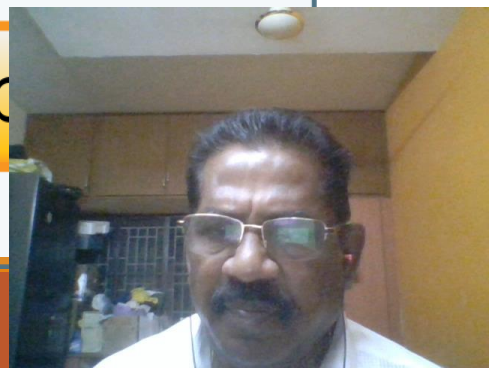
A horizontal stabilizer is used to maintain the aircraft in longitudinal balance, or *trim*: it exerts a vertical force at a distance so the summation of pitch moments about the center of gravity is zero.



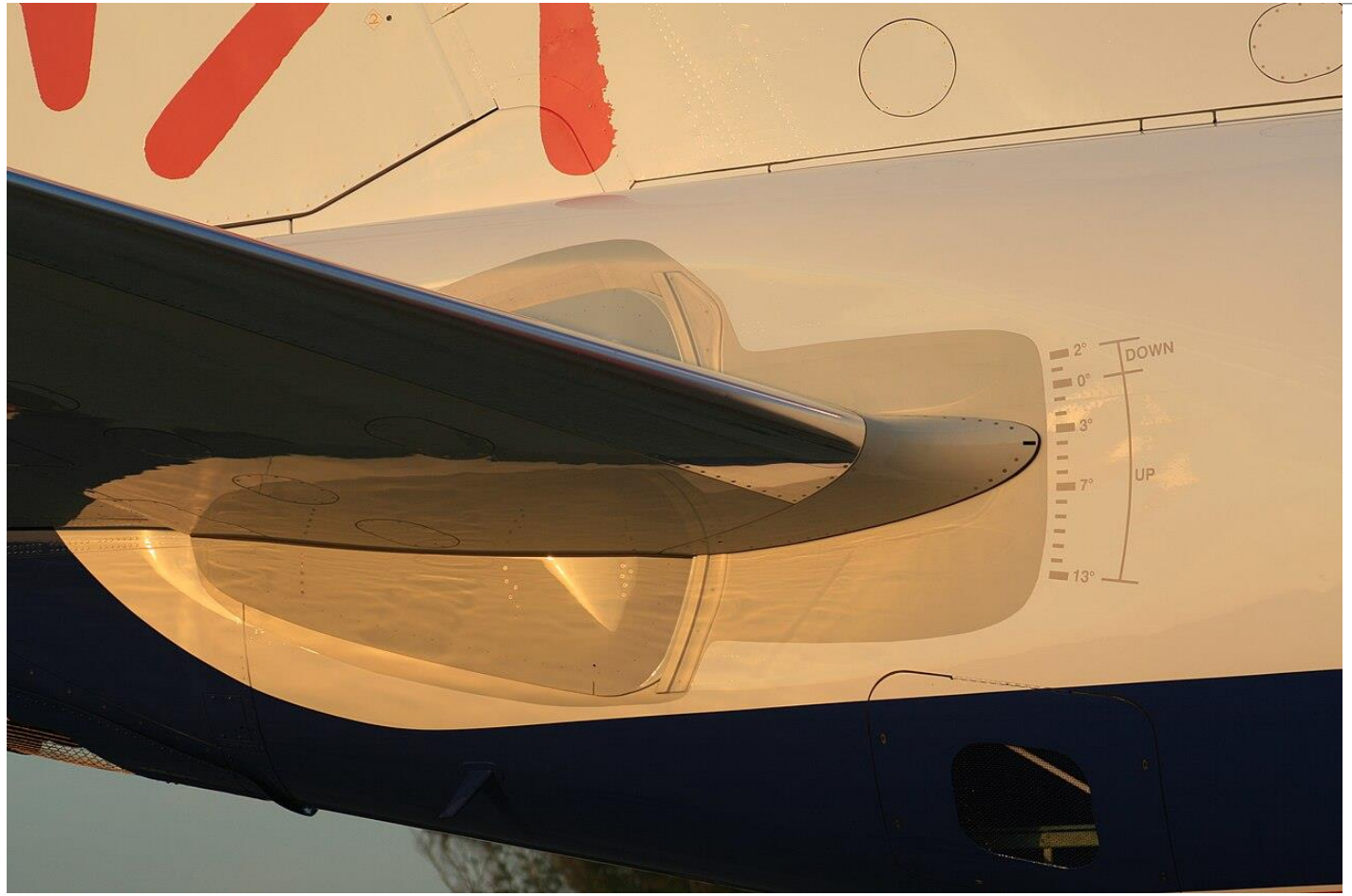


Adjustable stabilizer





Adjustable stabilizer

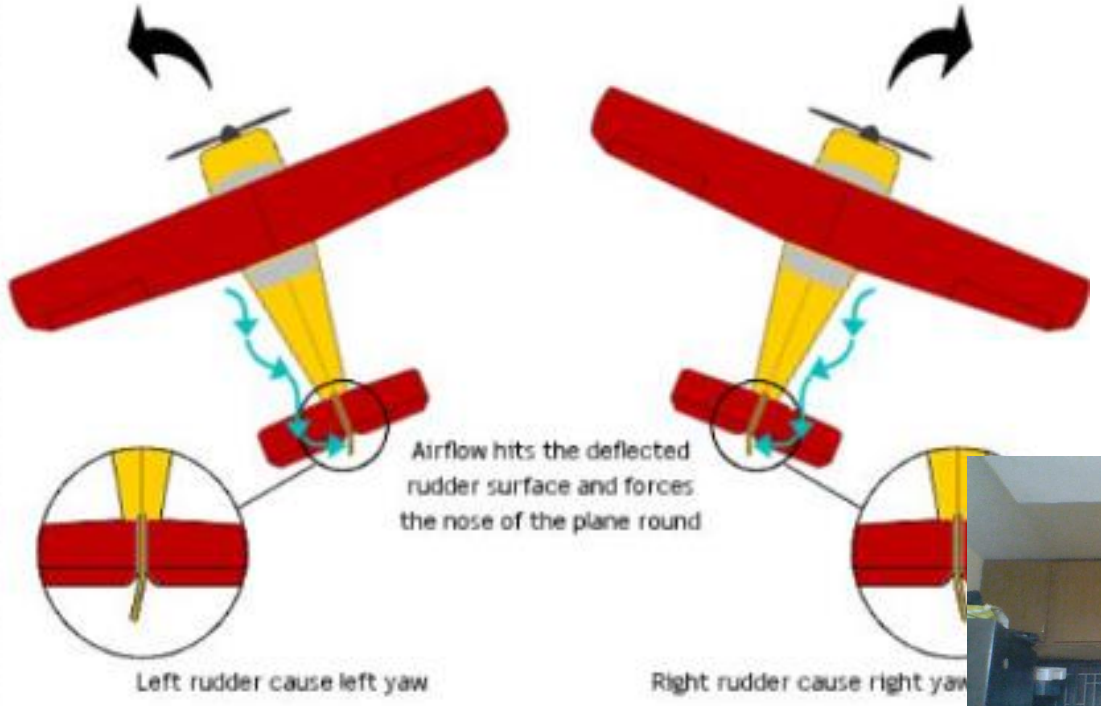


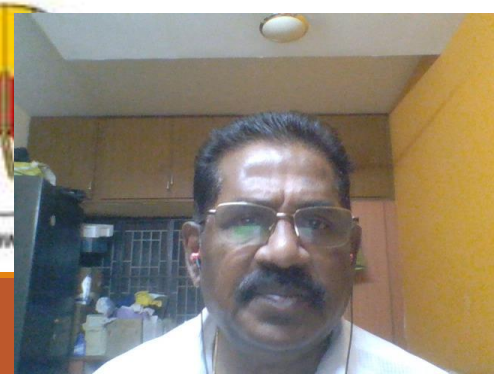
Are adjustable stabilizers the same as stabilators?

- Adjustable stabilizers are not the same as stabilators: a stabilator is controlled by the pilot's control yoke or stick, whereas an adjustable stabilizer is controlled by the trim system.
- In the Boeing 737, the adjustable stabilizer trim system is powered by an electrically operate

Rudder

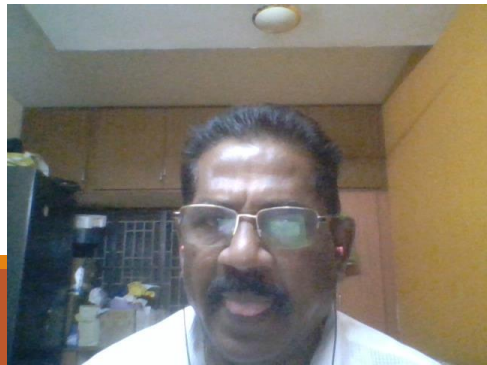
- Located on the Vertical Stabilizer (tail)
- Controls the aircraft's yaw
- Right Rudder = Right Yaw
- Left Rudder = Left Yaw





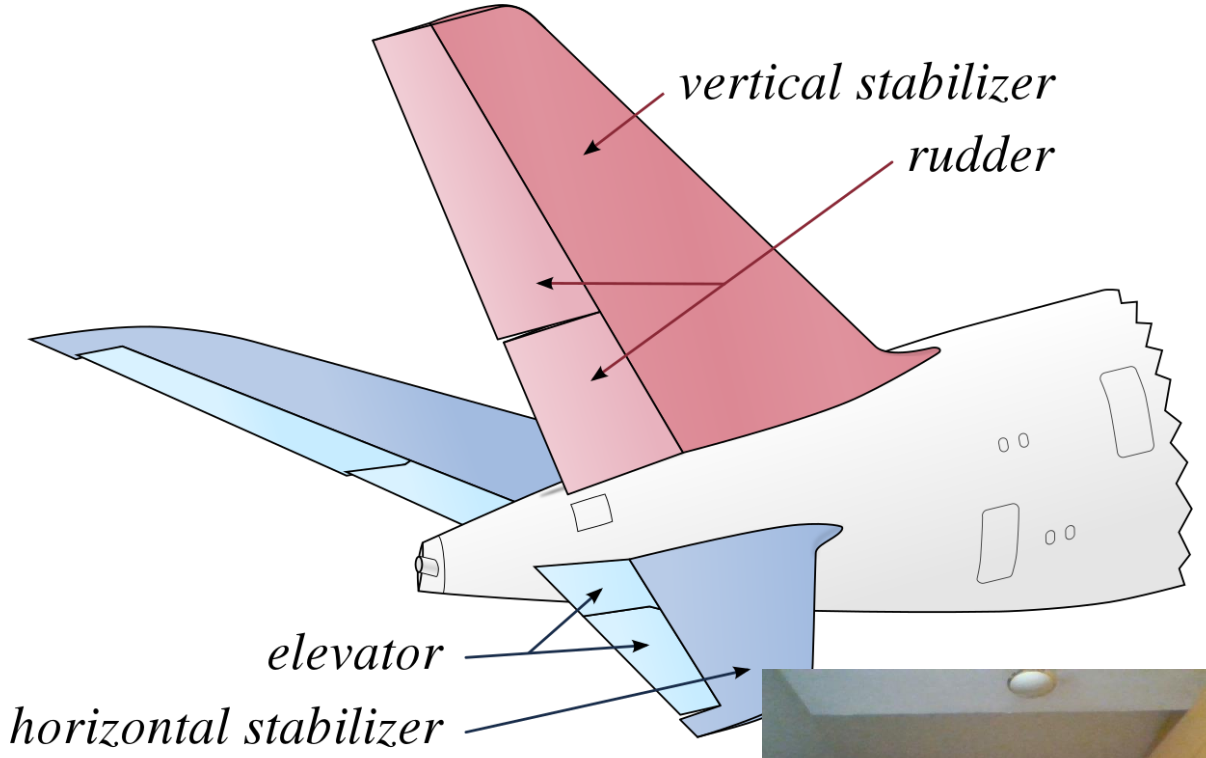
RUDDER

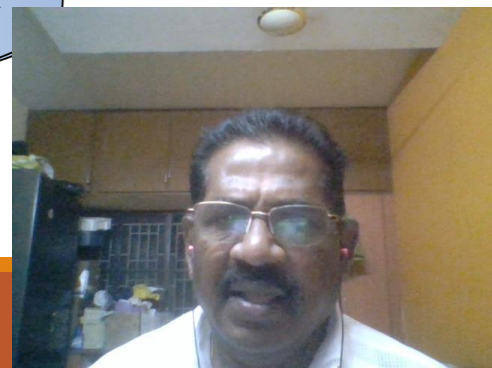
- On the trailing edge of the vertical stabilizer is the **Rudder**.
- This controls the **yaw** or the left/right sliding movements of the aircraft.
- On a real aircraft, this is controlled by the foot pedals
- When the pilot pushes the left pedal, the rudder deflects left. Pushing the right pedal causes the rudder to deflect right.



Elevators

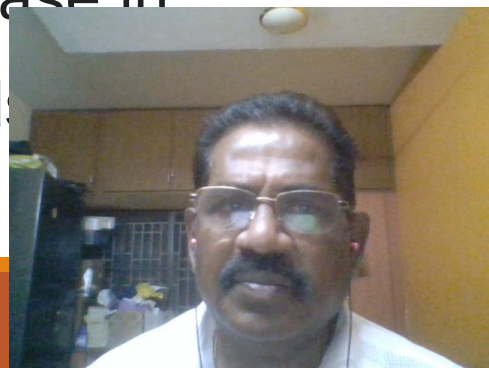
Elevators are flight control surfaces, usually at the rear of an aircraft, which control the aircraft's pitch, and therefore the angle of attack and the lift of the wing. The elevators are usually hinged to the tailplane or horizontal stabilizer. They may be the only pitch control surface present, and are sometimes located at the front of the aircraft (early airplanes) or integrated into a rear "all-moving tailplane", also called a slab elevator or stabilator.





Both the horizontal stabilizer and the elevator contribute to pitch stability, but only the elevators provide pitch control.[1] They do so by decreasing or increasing the downward force created by the stabilizer:

- an increased downward force, produced by *up* elevator, forces the tail down and the nose up. At constant speed, the wing's increased angle of attack causes a greater lift to be produced by the wing, accelerating the aircraft upwards. The drag and power demand also increase;
- a decreased downward force at the tail, produced by *down* elevator, causes the tail to rise and the nose to lower. At constant speed, the decrease in angle of attack reduces the lift, accelerating the aircraft downwards

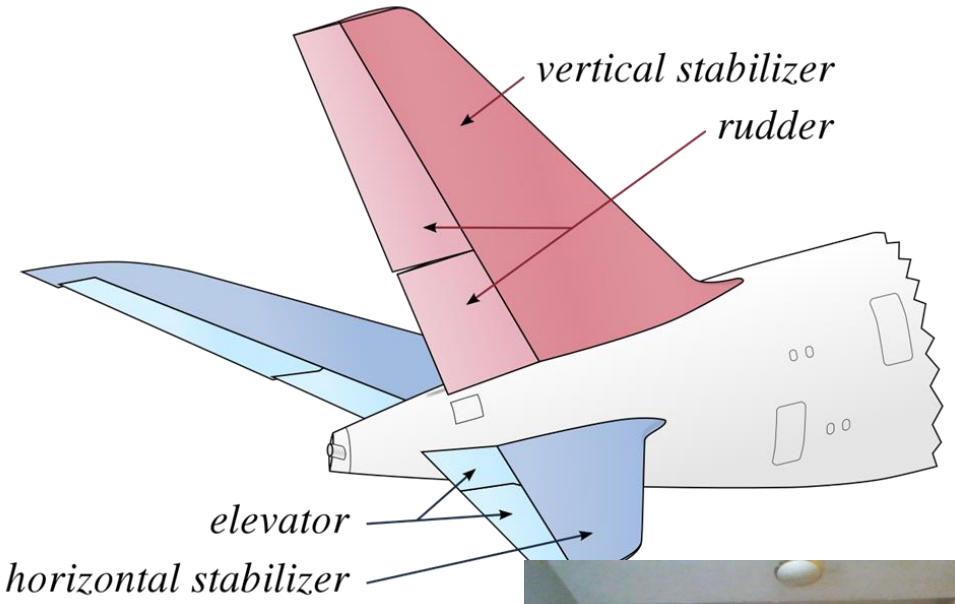


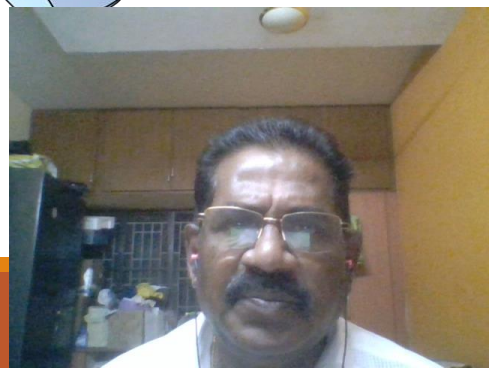
What is a vertical stabilizer?

A vertical stabilizer, along with the horizontal stabilizers, makes up the empennage.

The vertical stabilizer is equipped with a movable **rudder**, which gives the pilots yaw control - the ability to turn the airplane left and right.

Some vertical stabilizers are also fitted with trim control, providing the ability to make finer adjustments, according to information from NASA.





Why don't birds need them?

Birds have infinitely controllable, adaptable, and flexible wings that can provide yaw control through adjustments to the shape, span, and sweep.